CLAIMS

1. A composite spectral measurement method implemented by an incident unit, a probe, a receiving unit and a data processing unit, which is characterized in that:

an incident light source in said incident unit is a composite light source, which is comprised of a continuous light source and a discrete light source; that is, the continuous light source includes at least one single wavelength light source, or is composed of a continuous light source and continuous light sources with different characteristics;

said probe may make the continuous light source and the discrete light source to conduct light incidence and receipt at one and the same position, and decide a layout of optical lengths according to light intensities of respective light sources, or may make the continuous light source and the discrete light source to conduct light incidence and receipt at different positions, and decide a layout of optical lengths according to light intensities of respective light sources;

the composite spectral method is implemented in said receiving unit, which includes adding the continuous and discrete spectra overlapped and adding the continuous and discrete spectra non-overlapped;

in said data processing unit, the composite spectra received by the receiving unit are analyzed and calculated by using a mathematical model so as to derive a concentration of a certain component of interest such as blood glucose.

2. The composite spectral measurement method according to Claim 1 is characterized in that said continuous light source is an acoustic optical tunable filter NIR spectrometer; said discrete light source is a light-emitting diode LED, or a laser diode LD, or a tunable semiconductor laser, and preferably it is one or several LDs; said continuous light source is light-split by an AOTF selectively, and said discrete light source LD is light-split by the AOTF selectively or controlled by a spatial chopper, wherein a wavelength range of said continuous light source can be any wavelength band within 0.8~2.5μm, while for that of said discrete light source, several wavelengths within or beyond the wavelength range of said continuous light source can be chosen.

3. The composite spectral measurement method according to Claim 1 is characterized in that switching of said composite light source can be conducted by a light path switching or a circuit switching controlled or uncontrolled by AOTF, wherein the light path switching can be realized by using electrical signal to control electrical shutter, while the circuit switching can be achieved by a spatial chopper or a computer.

4. The composite spectral measurement method according to Claim 1 is characterized in that the sequential control can be achieved in two ways: one is to separately measure the continuous spectra and discrete spectra, that is, first measure the continuous spectra, then the discrete spectra, or the discrete spectra first while the continuous spectra later; the other one is cross measurement, that is, the continuous spectra and discrete spectra are alternately measured in the order of wavelengths.

5. The composite spectral measurement methods according to any one of Claim 1 to 4 is characterized in that both said continuous light source and said discrete light

source are light-split by AOTF; in every measurement cycle, the AOTF starts first, and when the AOTF reaches the wavelength of each discrete light source, a D/A conversion card controls the AOTF to begin its special working mode, and then the combined spectra are superposed and pass the AOTF; at the same time, said computer is notified and then it gives a control signal to select and start corresponding photoelectric conversion and processing circuits 13, 14 and 18 with different gains; after that, the AOTF returns to its normal working mode.

6. The composite spectral measurement methods according to any one of Claim 1 to 4 is characterized in that the AOTF conducts light-splitting for said continuous light source, whereas said discrete light source directly irradiates on said probe; in every measurement cycle, the AOTF starts first, and when the AOTF reaches the wavelength of each discrete light source, a D/A conversion card controls the AOTF to begin its special working mode, and then the combined spectra are superposed and pass the AOTF; at the same time, said computer is notified and then it gives a control signal to select and start corresponding photoelectric conversion and processing circuits 13, 14 and 18 with different gains; after that, the AOTF returns to its normal working mode.

7. The composite spectral measurement methods according to any one of Claim 1 to 4 is characterized in that the AOTF conducts light-splitting for said continuous light source, whereas said discrete light source directly irradiates on said probe; in every measurement cycle, the AOTF starts first, and when the AOTF reaches the wavelength of each discrete light source, a D/A conversion card controls the AOTF to let said discrete spectra among the composite spectra pass, but prevent the continuous spectra from passing; at the same time, said computer is notified and then it gives a control signal to select and start corresponding photoelectric conversion and processing circuits 13, 14 and 18 with different gains; after that, the AOTF returns to its normal working mode.

8. The composite spectral measurement methods according to any one of Claim 1 to 4 is characterized in that the AOTF conducts light-splitting for said continuous light source, whereas said discrete light source directly irradiates on said probe; in every measurement cycle, said continuous light source controlled by AOTF starts first; when one cycle is completed, a D/A conversion card controls each discrete light source and enables it to begin work, and at the same time, said computer is notified and then it gives a control signal to select and start corresponding photoelectric conversion and processing circuits 13, 14 and 18 with different gains.

9. A spectral detection instrument using the composite spectral measurement method according to Claim 1, which includes three modules, an incident unit (1a), a probe (1) and a receiving unit (1b), and is characterized in that:

an incident light path of said probe (1) is composed of an incident fiber (2) of said continuous light source and an incident fiber (6) of said discrete light source; an AOTF crystal (4) is used for light-splitting; said discrete light source (9) can be one or several LDs of different wavelengths, a set of focusing lens is used for coupling said LD with said transmission fiber (6) of said discrete light source, at the same time, an LD gating baffle (7) controlled by a spatial chopper (7a) is chosen as a gating switch; a receiving light path of the probe (1) is configured through a connection between a receiving fiber and photoelectric conversion and processing circuits (13 and 14) with different gains; after that, a control function of a controller (12) is achieved by choosing, by a computer, output signals in corresponding channels of the photoelectric conversion and processing circuits (13 and 14); after being processed by a shielded thermal equilibrium cover and a fine tuning alignment device (15), the output signal is transferred to an NI terminal board or a shielded joint (16), and finally a relevant data processing is performed by a computer (17).

10. The spectral detection instrument using the composite spectral measurement method according to Claim 9 is characterized in that said incident light path of said discrete light source of said incident unit is light-split by the AOTF crystal (4) selectively similarly to said continuous light source.

11. The spectral detection instrument using the composite spectral measurement method according to Claim 9 is characterized in that said receiving light path of said probe (1) is configured through a direct connection of said receiving fiber (11) or (19) and (20) with said gain-tunable photoelectric conversion and processing circuit (18); after being processed by said shielded thermal equilibrium cover and said fine tuning device (15), the output signal is transferred to said NI terminal board or said shielded joint (16), and finally said relevant data processing is performed by said computer (17).

12. The spectral detection instrument using the composite spectral measurement method according to Claim 9 is characterized in that in said probe (1), said continuous light source and said discrete light source are placed at one and the same position; in the central position of said probe, said discrete light source transmission fiber (6) and said continuous light source transmission fiber (2) are placed; said receiving fiber (11) is provided in an external ring of said probe; such a layout effectively concentrates incident light intensity, and simultaneously prevents a majority of stray light that hasn't been scattered by deep tissue but only reflected by surface from being received.

13. The spectral detection instrument using the composite spectral measurement method according to Claim 9 is characterized in that said continuous light source and discrete light source are place at different positions; said discrete light

source transmission fiber (6) is placed in the centre of said probe, and said inner receiving fiber (19) is placed in its internal ring, while said outer receiving fiber (20) is placed in its external ring, and said continuous light source transmission fiber (2) is placed in it middle ring; such a layout utilizes the light intensity of said discrete light source thoroughly, where dispersed light irradiates on the target position, and the internal and external light paths are used to receive the fully reflected light from the tissue, greatly increasing the intensity of detectable biological signals.

14. The spectral detection instrument using the composite spectral measurement method according to Claim 9 is characterized in that said discrete light source LD in the incident unit (1a) of said non-invasive detection instrument is coupled with an optical fiber, wherein said discrete light source LD (9) is coupled with said discrete light source incident fiber (6) through said focusing lens (8a and 8b).

15. The spectral detection instrument using the composite spectral measurement method according to Claim 9 is characterized in that in blood glucose measuring, optional wavelengths of said discrete light source are 980nm, 1310nm, 1550nm, 1610nm and 1650nm.